Ballast water treatment technologies and compliance assessment in California

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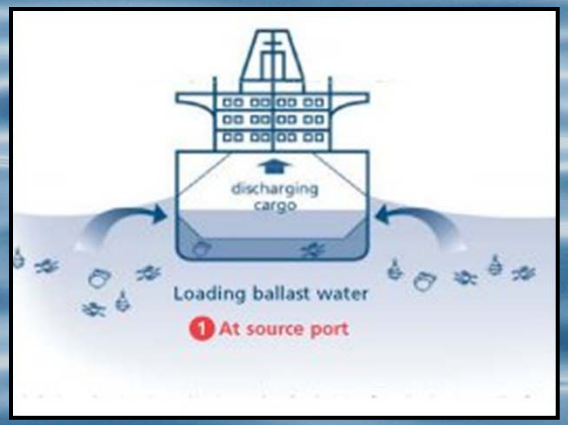
Presentation outline

- Ballast water as a vector (transport mechanism) for invasive species
- History and authorities related to MISP
- General findings of 2012 ***draft*** ballast water treatment technology report
- Compliance assessment protocol development
- Funded research

Shipping vectors include ballast water and vessel fouling



Shipping Vectors

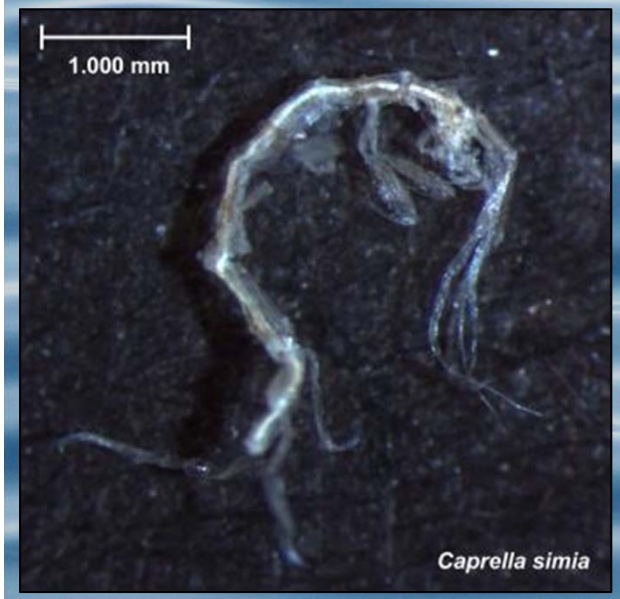
~ 81% Introductions to N. America

Ballast Water

- Potentially 21,100,000 organisms per discharge

California: Gateway for Pacific coast marine invasive species

CA Dept. of Fish and Wildlife (2011) reports three new introduced species in San Francisco Bay



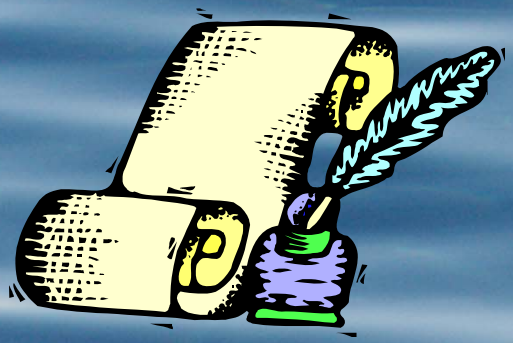
Caprella simia, skeleton shrimp

Grateloupia lanceolata, red alga

Nicolea sp., worm

All are likely ballast water and/or biofouling introductions.

California Marine Invasive Species Program (MISP)



1999 Ballast Water Management Control for Nonindigenous Species Act

- Foreign ballast water management
- Reporting, record keeping, inspections

2003 Marine Invasive Species Act (Reauthorization & Expansion)

- Coastal ballast water
- Vessel fouling
- Ballast water performance standards

2006 Coastal Ecosystems Protection Act

Performance Standards for Ballast Water Discharge

Limitations of Ballast Water Exchange

- Safety
- Deviation & delay
- Variable efficacy (70-98%)

Treatment Technologies

- Potential for better protection
- Eliminate deviations & delays
- Reduce some safety issues

Lack of a target, or "Performance Standard" = Little technology development

2003 MISA directed CSLC to identify Performance Standards for Ballast Water Discharge by January 31, 2006

California's Performance Standards

Organism Size Class	Performance Standard
Organisms greater than 50 µm in minimum dimension	No detectable living organisms
Organisms 10 – 50 µm in minimum dimension	< 0.01 living organisms per ml
Living organisms less than 10 µm in minimum dimension	< 10^3 bacteria/100 ml < 10^4 viruses/100 ml
Escherichia coli	< 126 cfu/100 ml
Intestinal enterococci	< 33 cfu/100 ml
Toxicogenic *Vibrio cholerae* (O1 & O139)	< 1cfu/100 ml or < 1cfu/gram wet weight zoological samples

Implementation Schedule

Ballast Water Capacity of Vessel	Standards apply to new vessels in this size class constructed on or after	Standards apply to all other vessels in this size class beginning in
< 1500 metric tons	2010	2016
1500 – 5000 metric tons	2010	2014
> 5000 metric tons	2012	2016

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8%

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Legislatively Mandated Reports

Available online: www.slc.ca.gov

Ballast Water Treatment System (BWTS) Technology Report

- Efficacy, availability, environmental impact of BWTS
- Retrofits: Existing vessels, 1500-5000 metric ton ballast capacity
- Draft is now available online

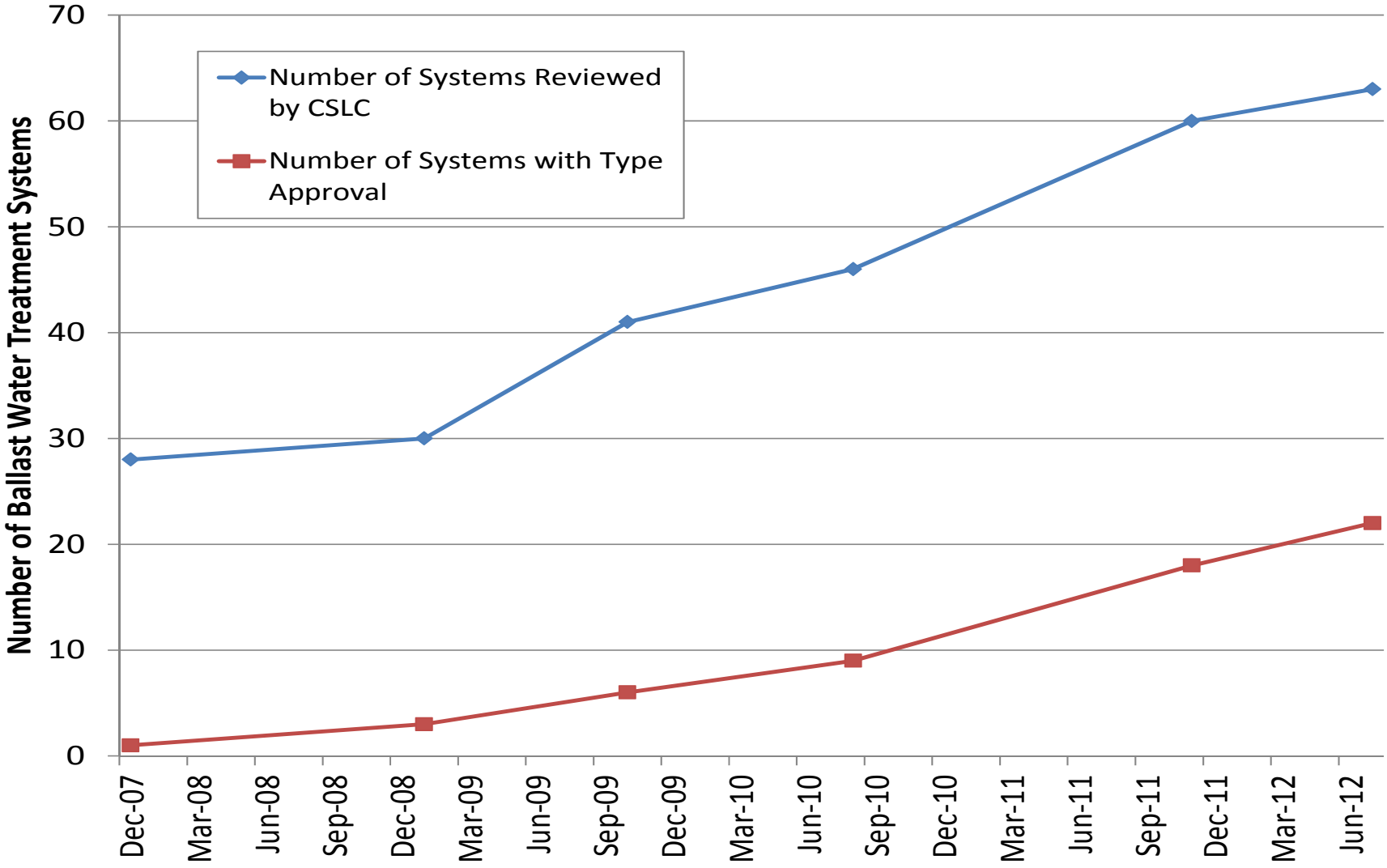
Biennial Report of the CSLC – MISP, January 2013

- Regulatory overviews: Biofouling and ballast water
- Data analyses: Vessel traffic, compliance
- Current funded research review

Options for Meeting CA Performance Standards

- Retain all ballast on board
  - Most protective management strategy
  - 85% of vessel voyages to CA do not discharge
- Discharge to approved shoreside reception facility
- Discharge to a barge-based reception facility
- Install shipboard treatment system and treat all ballast prior to discharge

Systems and available data are increasing



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CAL MARITIME

System efficacy is improving, though uncertainty remains.

- No systems met all standards in 100% land-based tests
- Cannot yet reach a conclusion for viruses
- Organisms in 10-50 micron range – data sensitivity issue
- **12** systems demonstrated ability in at least one test to meet all other CA standards
- **6** systems demonstrated ability in 50% land-based or shipboard tests
- **3** systems demonstrated ability in 100% shipboard tests

System efficacy is improving, though uncertainty remains.

- How will systems perform under real-world conditions?

- How to address remaining uncertainties while improving on current management requirements (exchange)?

If our understanding is to improve, California needs to collect data on system performance under operational conditions.

Proposed protocols for evaluating compliance with ballast water discharge standards

Establish clear, detailed protocols for compliance assessment

Necessary to assess compliance with California law

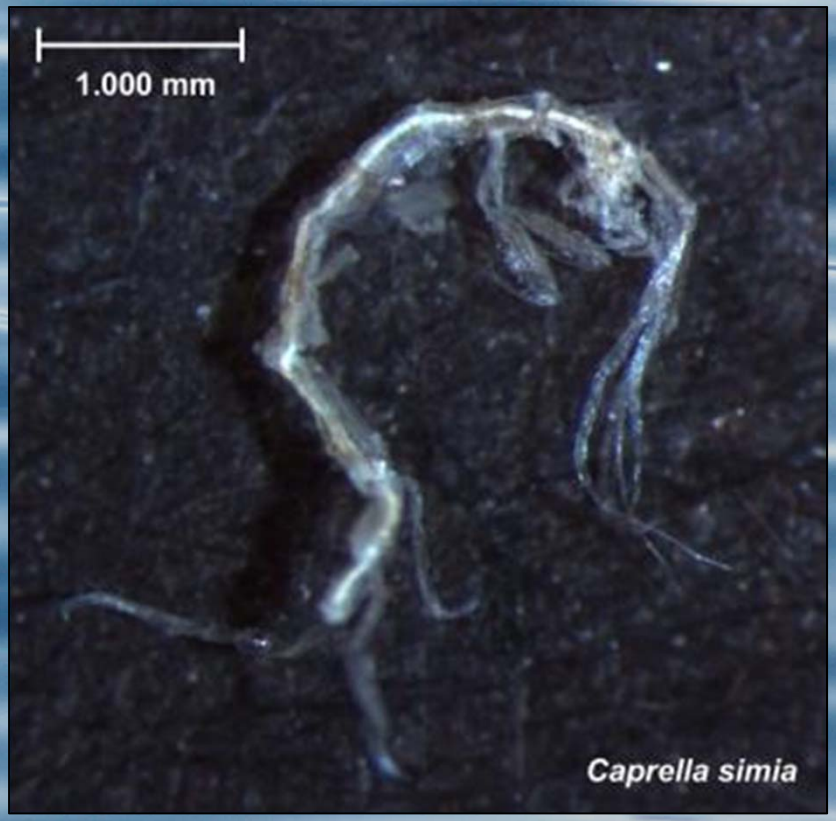
Provide data to determine whether ballast water treatment systems are operating as represented

-enforcement abeyments

Organisms >50 microns

Method: Counting under light microscope

Standard: No detectable living organisms



Grandfathering provisions

Protocols to evaluate compliance are expected to improve

Protocols in place at the time of BWTS installation used to evaluate vessel's ballast water for 10 years following installation date

Funded Research

Ballast water performance standard compliance monitoring

- Dr. Nick Welshmeyer – Bulk FDA viability assay
- Glosten Associates – Onboard ballast water sampling tool
    - Planned tests at Golden Bear Facility

N.E.I. treatment system: APL England

Aquatic Bioinvasion Research and Policy Institute

- Joint program – PSU and SERC

Summary

- Performance standards for ballast water discharges are being implemented
- Ballast water treatment technologies currently limited to shipboard systems, room for diversification
- Shipboard systems continue to improve, uncertainties remain and can be addressed by installation on vessels
- Compliance assessment protocols under development
- Funded research: Includes rapid assessment methods and shipboard assessment tools

Thank You